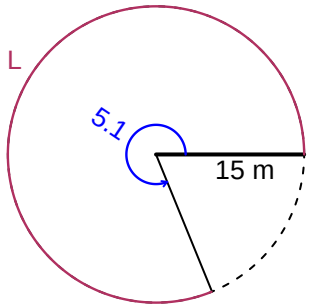
Name: Date:

Trig Final (Solution v43)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.1 radians. The radius is 15 meters. How long is the arc in meters?

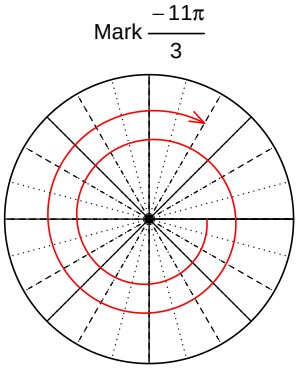


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

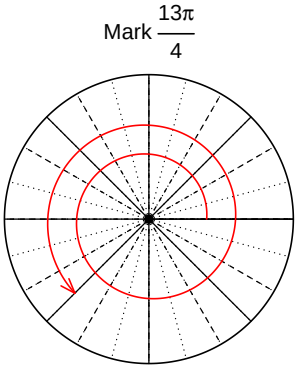
$L = 76.5$ meters.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{3}\right)$ and $\sin\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-11\pi/3)$



Find $\sin(13\pi/4)$

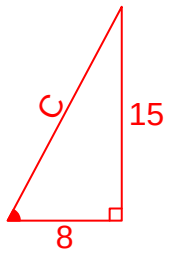
$\cos(-11\pi/3) = \frac{1}{2}$

$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-15}{8}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

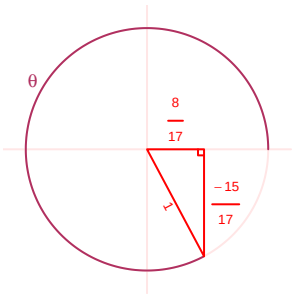
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$
$$C = \sqrt{8^2 + 15^2}$$
$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{8}{17}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.07 Hz, a midline at $y = 4.53$ meters, and an amplitude of 3.17 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.17\cos(2\pi 2.07t) + 4.53$$

or

$$y = 3.17\cos(4.14\pi t) + 4.53$$

or

$$y = 3.17\cos(13.01t) + 4.53$$